Language Teaching Research Quarterly **EUROKD**

2026 (54), 339–361
https://doi.org/10.32038/ltrq.2026.54.14

Assessing Artificial Intelligence Literacy among Chinese EFL University Students: Current Status and Associated Factors

Liuzhi Zhang
Faculty of Education, Language and Communication, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia
Ruey Shing Soo*
Faculty of Education, Language and Communication, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia

Correspondence
Email: rssoo@unimas.my

Abstract
AI literacy is crucial for EFL university students successfully integrating AI into language learning in AI era, however, little is known about the current state of AI literacy among Chinese EFL students. This study addresses this gap by examining their AI literacy levels. Survey data from 384 Chinese EFL students were analyzed with descriptive and inferential statistical analysis. Results showed that all four dimensions had mean scores above the midpoint of the seven-point Likert scale (ranging from 5.25 to 5.42), with AI ethics scoring highest and AI evaluation lowest. Accordingly, post-hoc analyses revealed a significant difference between these two dimensions. No significant differences in AI literacy scores were observed by gender or English proficiency, whereas differences by academic year and field of study were marginal statistical significance. Furthermore, there was moderate strong relationship among the four dimensions of AI literacy, particularly strong between AI usage and evaluation (r = 0.697). These findings provide insights for integrating AI into EFL education and suggest that AI literacy develops as an integrated competency.

ARTICLE HISTORY
Received: 10 November 2025
Revised: 16 April 2026
Accepted: 05 May 2026

KEYWORDS
AI literacy, Awareness, Usage, Evaluation, Ethics, EFL University Students

How to cite this article (APA 7th Edition):
Zhang, L., & Soo, R. S. (2026). Assessing artificial intelligence literacy among Chinese EFL university students: Current status and associated factors. *Language Teaching Research Quarterly*, *54*, 339–361. https://doi.org/10.32038/ltrq.2026.54.14

Introduction

Currently, the society has witnessed the booming development of AI technology in a wide range of fields. It brings unprecedented profound transformation in higher education with optimizing teaching methods, restructuring learning ecosystems, and adjusting

institutional strategies (Lin & Zhou, 2025). In English as a Foreign Language (EFL) field, AI applications have also significantly improved students' learning outcomes by offering tailored feedback, boosting their motivation and engagement, and supporting the improvement of specific linguistic skills (Al-khreshehm, 2024), such as listening, oral expression, writing (Almehmadi, 2024), and reading (Daweli & Mahoub, 2024). In addition, research found that students could improve their intercultural communication competence by integrating AI tools into their EFL learning (Klímová & Chen, 2024). Although AI applications are becoming increasingly widespread, students commonly encounter multiple obstacles in effectively integrating them into their learning practices.

Some students encounter operational difficulties during use (El Hassan & Alsalwah, 2025), while others fail to utilize these tools correctly and responsibly (Yılmaz Virlan & Tomak, 2025). Similar challenges have been reported in Chinese educational settings (Ma & Chen, 2024). To overcome these challenges, students need to comprehend some knowledge about AI literacy, which is commonly conceptualized as the competence to accurately recognize, utilize, and assess AI tools and AI-generated content within ethical standards (Wang et al., 2023).

AI literacy is important not only for profession experts in the computer field but for all citizens (Rožman et al., 2025). For students, AI literacy is becoming a basic requirement for the future. They not only understand the technical principles behind AI tools but also recognize and leverage the opportunities it brings while fully considering the associated risks and ethical issues (Ng et al., 2024). Beyond technical knowledge, students equipped with some knowledge about AI literacy can evaluate AI applications and AI - generated outcomes critically, thereby enhancing their academic involvement and autonomous learning ability (Wang et al., 2024; Zhang et al., 2025).

Given these benefits, developing AI literacy among students is essential for preparing them for a job market increasingly shaped by advanced technologies. Extensive research consistently revealed that higher AI literacy could enhance learners' engagement with AI tools, leading to better academic performance, and enhanced contentment in learning (Singh et al., 2024).

Although early research on AI literacy mainly focused on STEM fields, other studies claimed students in non-technical disciplines should also have foundational AI education (Kong et al., 2021). It is urgent to integrate AI literacy education into humanities and social sciences disciplines, which is not only beneficial for the development of these disciplines but also prepares students for the fast-changing workplace (Abdennour et al., 2025). There is, however, now a consensus that students in non-technical fields need to master some knowledge about AI literacy. An issue that warrants exploration is whether students in non-technical disciplines can benefit from the same AI education. Given the extensive utilization of AI in areas like philosophy, psychology, and culture, it is of great pivotal importance to implement interdisciplinary AI education.

Within this context, AI literacy occupies an indispensable position in the EFL domain and great efforts should be given. As AI tools have become essential to EFL students' daily learning, developing their AI literacy is crucial. AI literacy enables EFL learners to analytically assess and evaluate AI applications incorporated within educational platforms (Zhang et al., 2025). Specifically, education on AI literacy involves not only understanding the basic concepts, functions, and application scenarios of AI tools in language learning (Crompton et al., 2024), but also the ability to assess the quality of AI-generated content, detect factual inaccuracies, and identify cultural inappropriateness (Pérez-Paredes et al., 2025). Additionally, it means understanding knowledge on data privacy and academic integrity, helping students use AI tools in a responsible way (Pack & Maloney, 2024). Consequently, AI literacy in EFL education is far beyond technical proficiency. Its main goal is to cultivate students the capability to leverage AI tools following ethical and responsible norms.

However, little is known about present condition of AI literacy among Chinese EFL university students. In China, the number of EFL learners is the largest in the world (Li, 2023). These EFL learners are utilizing AI tools in their daily study. So, it is insightful to explore EFL learners' AI literacy under the Chinese university context. Investigating the AI literacy level among Chinese students offers insights for other EFL learners around the world.

In line with this, there are three aims in this study: 1) to explore the current state of AI literacy among Chinese EFL students; 2) to investigate whether demographic variables (such as gender, English proficiency, academic discipline, and year of study) demonstrate influence on their AI literacy; and 3) to find out the interrelationships among the four constructs of AI literacy—awareness, usage, evaluation, and ethics. For this purpose, there are research questions proposed as follows:

RQ_{1a}: What are Chinese undergraduate EFL students' AI literacy levels across the four dimensions of awareness, usage, evaluation, and ethics?

RQ_{1b}: Are there significant differences in the levels of these four dimensions?

RQ2: Are there significant differences in Chinese undergraduate EFL students' AI literacy based on demographic characteristics such as English proficiency, gender, field of study, and academic year?

RQ3: What are the correlations among the dimensions of AI literacy, including awareness, usage, evaluation, and ethics, among Chinese undergraduate EFL students?

This study not only provides insights for educational intervention in the EFL domain but also offers empirical grounds for instruction by examining differences across these dimensions and exploring the influence of demographic variables (gender, English proficiency, academic background, and academic year) on AI literacy, respectively. Besides, analysis of the interrelationships among the four dimensions is helpful to decide whether AI literacy education should be improved overall or through specific dimensions. Taken together, this study improves theoretical understanding of AI literacy in the

Chinese EFL domain and provides educators with empirical data for curriculum design and offers students practical guidance for responsible and effective AI use.

Literature Review

Conceptualizations of AI Literacy

The definition of artificial intelligence literacy (AI literacy) was initially used to emphasize the competency structure required for professionals in the AI domain (Agre, 1972). It not only originated from digital literacy but also developed independently due to the fast advancement of AI technology (Ng et al., 2021). Individual are urgently asked to leverage AI tools in responsible and ethical manner in an age dominated by AI (Hackl et al., 2026). Regarding this point, individuals must be equipped with relevant competence to efficiently engage with AI systems, evaluate their outcomes, and navigate ethical considerations (Almatrafi et al., 2024). Such relevant competence have been conceptualized as AI literacy by various scholars. They proposed diverse interpretations for it (Kong et al., 2021; Long & Magerko, 2020; Ng et al. 2021; Wang et al., 2023).

Long and Magerko (2020) defined AI literacy as a collection of fundamental capabilities that allow individuals to critically evaluate AI technologies, utilize and work collaboratively with AI, and utilize them effectively in different environments, including online, at home, and in the workplace. In addition, Ng et al. (2021) proposed a framework of AI literacy covering four key constructs: knowing and understanding AI, use and application, evaluation and creation, and ethical considerations. Furthermore, Kong et al. (2021) declaimed that AI literacy encompasses comprehending of AI concepts, as well as the ability to apply these knowledge to assess and know the real world. Wang et al. (2023) recently defined AI literacy as the capability to appropriately recognize, apply, and assess AI products while adhering to ethical principles.

Obviously, these definitions embody different focus. Some emphasize operational ability and practical application (Kong et al., 2021; Long & Magerko, 2020). Other focused on evaluation and creation (Ng et al., 2021). In contrast, Wang et al. (2023) places greater emphasis on ethical standards in their definition, proposing that AI literacy should involve the competence to appropriately identify, apply, and evaluate AI products and content generated by AI products within an ethical framework. They lied great stress on ethical competence among AI literacy framework, which echos the great importance attached to academic integrity and moral responsibility in higher education. In this regard, Wang et al.'s definition of AI literacy offers more instructive guidance in terms of ethical depth and social responsibility, making it particularly crucial for future AI literacy education.

Four Domains of AI Literacy Framework

This study adapted the theoretical structure proposed by Wang et al. (2023) and defined AI literacy for EFL students under the framework with four dimensions: awareness, usage, evaluation, and ethics.

Awareness

The awareness dimension refers to the competence to recognize and understand AI technology during interaction with AI applications. This foundational knowledge enables users to understand what artificial intelligence is and its importance in Human-technology communication processes (Pinski & Benlian, 2023). High awareness about AI tools makes individuals recognize AI applications' functions and boundaries so that they can adapt them more assured and positive(Sun & Li, 2026). For EFL students, they should be aware of the various applications of AI technology in English learning, such as intelligent speech recognition, translation tools, and writing assistance tools.

Usage

Usage means the capacity to leverage AI systems for efficient completion of tasks. This includes the ability to easily access AI applications, proficiently operate, and effectively integrate them. Research has shown that effective usage of AI tools can enhance outcomes of language acquisition, but improper usage may lead to superficial learning or academic integrity violations (Al-Khreshehm, 2024). For EFL learners, they are able to skillfully and flexibly operate these tools to improve language learning outcomes.

Evaluation

Evaluation refers to the ability to assess, select, and critically judge AI applications and their outcomes. Special emphasis is placed on evaluating AI outputs. This is because some outputs generated by AI applications may be entirely fabricated or contain errors, despite appearing formally correct and credible (O'Dea et al., 2024). This requires that the EFL university students analyze and judge the AI-generated content.

Ethics

Ethics refers to the capabilities to know the duties and potential hazards associated with the utilization of AI. The ethical issues are the public's primary concern in the AI era. The AI tools not only bring convenience but also render people thinking seriously and clearly about the intelligent and ethical issues involved. Thus, it is significant for students to know the obligations and risks during interaction with AI tools. For EFL students, it encompasses an understanding of data privacy and academic integrity, helping students foster responsible usage habits (Pack & Maloney, 2024).

This study adopts the AI literacy four-dimensional framework proposed by Wang et al. (2023) primarily because it has been validated not only within the Chinese educational context but also in other cultural backgrounds. Specifically, a study combined both quantitative and qualitative method analyzes the influencing factors of Chinese university students' AI usage intention, which confirms that the scale has good applicability and validity in the context of Chinese universities (Wang et al., 2024). Furthermore, Çelebi et al. (2023) demonstrated that the framework is adaptable to Turkish tertiary students. Sari et al. (2025) investigated the level of 542 university students in Indonesia context with this four-dimensional scale. Furthermore, across

diverse educational stages verified its validity and reliability, including K12 teachers (Al-Abdullatif, 2025) and teachers in higher education (Birhanu et al., 2026). These jointly verify its robust cross-cultural applicability and universal adaptability. By integrating global research findings with local educational needs, the framework proposed by Wang et al. (2023) provides a standardized and cross-culturally adaptable assessment tool for this study. Consequently, this study can explore deeper into EFL students' AI literacy with this framework, particularly their ethical sensitivity and critical thinking when using and evaluating AI tools, while offering robust theoretical support for future research in related fields.

There are also other theoretical frameworks on AI literacy proposed by research. For example, Wang and Wang (2026) innovatively proposed a four-dimensional AI literacy model of "cognition-skill-criticism-ethics" by integrating the latest domestic and international research findings and related policy documents. However, this framework focuses on the theoretical construction of AI literacy cultivation and has not corresponding measurement tools.

Zhang and Kang (2026) also developed a four-dimensional AI literacy including AI cognition, AI affectivity, AI behavior and AI ethics. They incorporated "evaluation" into the "AI cognition" dimension, overlooking its pivotal importance in the age of AI. Le et al. (2026) have demonstrated that evaluation is a major tool to address AI hallucinations (uncritical acceptance of AI-generated output), over-reliance, and ethical risks. Furthermore, although UNESCO' s four-dimensional AI literacy (Human-centred mindset, Ethics of AI, AI techniques and applications, AI system design) have laid a solid empirical foundation for research on AI literacy, the empirical study by Wang et al. (2026) found that the implicit linear progression logic of "understand, apply, create" in this model is not fully applicable to the Chinese context, which further confirms the rationale for adopting the four-dimensional framework proposed by Wang et al. (2023) in this study.

AI Literacy in the EFL Context

In EFL settings, enhancing AI literacy is regarded as crucial for students to adapt to modern educational technologies and improve language learning outcomes. Consequently, an increasing number of studies focus on AI literacy in the EFL domain (Hossain & Hınız, 2025b; Jin & Rui, 2026; Moulavinafchi, 2025; Zhang et al., 2025).

Hossain and Hınız (2025b) found that AI literacy in EFL academic writing manifests specifically in students' familiarity with tools such as translation and grammar checking, as well as their technical operational capabilities. Besides academic writing, AI literacy also influences language production by affecting learners' psychological mechanisms. Zhang et al. (2025) demonstrated that AI literacy significantly impacts students' willingness to communicate. The impact of AI literacy extends beyond students to encompass the teaching community. Jin and Rui (2026) found that EFL teachers' AI literacy significantly influences their willingness to use AI applications in the classroom.

Meanwhile, Moulavinafchi's (2025) survey based on 112 Iranian EFL researchers revealed that their AI literacy levels are low in terms of nine dimensions, such as technical skills, ethical considerations, emotional regulation and so on.

Drawing on the above studies, Zhang et al. (2025) and Jin and Rui (2026) both confirmed that AI literacy positively predicts positive psychological or behavioral variables. Meanwhile, Hossain and Hınız (2025b) and Moulavinafchi (2025) jointly found that AI applications among both EFL students and researchers exhibit significant deficiencies in higher-order competence (such as evaluation and creation), indicating substantial room for improvement in AI literacy. Furthermore, both studies emphasize that ethical concerns were central to AI literacy.

Although existing research has revealed the significant role of AI literacy in EFL education in terms of different perspectives, they pay attention to students' academic writing, willingness to communicate, or teachers' acceptance. There remains a lack of systematic investigation into the current state of AI literacy among Chinese undergraduate EFL students. To address this gap, this study aims to systematically investigate the AI literacy levels of Chinese undergraduate EFL students.

The Impact of Demographic Variables on AI Literacy

In research on AI literacy, the influence of demographic variables on learners' AI literacy has increasingly become a focal point, particularly in terms of gender, field of study, academic year, and English proficiency. However, existing studies reveal discrepancies regarding the influence of these variables, suggesting their effects may vary across different contexts.

For example, the impact of gender on AI literacy remains controversial. Some studies indicate that male students exhibit slightly higher familiarity with AI tools, though the difference is not significant (Rožman et al., 2025). Sari et al. (2025) conducted a survey of 542 university students in Indonesia and the results showed that no differences existed across gender and age on students' AI literacy. Conversely, other research confirms that gender demonstrates a significant influence on both the frequency of AI usage and its intended purposes (O'Dea et al., 2024). Furthermore, drawing on a large-scale survey of 80,355 medical students in China, Li et al. (2026) found that male students are significantly higher AI attitude and behavior scores than their female counterparts. Previous studies have yielded inconsistent findings concerning the relationship between gender and AI literacy, which confirms further systematic investigation.

Similarly, the impact of academic year remains inconclusive. Rožman et al. (2025) found graduate students demonstrated higher AI literacy than undergraduates, whereas O'Dea et al. (2024) found no significant differences. Furthermore, in terms of field of study, multiple studies confirmed that students in STEM majors demonstrate significantly

higher AI literacy than those in other disciplines such as humanities and social sciences (Hornberger et al., 2023; O'Dea et al., 2024; Rožman et al., 2025). Finally, the relationship between English proficiency and AI literacy has also gradually drawn attention. Research by Hossain et al. (2025a) indicated that English proficiency is positively correlated with familiarity and comprehension of AI technologies, but its overall impact on AI literacy remains relatively limited.

The inconsistencies observed in the existing studies reflect, to some extent, that the impact of demographic variables is context-dependent and may depend on national education policies, cultural backgrounds. Although existing literature has revealed the influence of demographic variables on AI literacy, systematic research targeting the specific group of Chinese EFL students remains insufficient. To address this gap, this study aims to systematically investigate the current state of AI literacy among Chinese undergraduate EFL students and explore the effects of demographic variables—including gender, academic background, academic year, and English proficiency—on their AI literacy. This research seeks to provide empirical evidence for developing AI literacy cultivation strategies in China's EFL education, thereby advancing the creation of educational programs better tailored to the needs of Chinese students.

Interrelationships among Four Dimensions of AI Literacy

According to Wang et al. (2023), they claimed that there are four main constructs constituting AI literacy, including awareness, usage, evaluation, and ethics. They validated the effectiveness of these four dimensions within the AI literacy framework, in which all are interrelated with each other. Prior empirical research has revealed the complex interrelationships among these dimensions (Al-Abdullatif, 2025; Zhao et al. 2022). These findings are particularly significant in educational practice and play a crucial role in enhancing the AI literacy of both teachers and students.

Zhao et al. (2022) showed that usage not only improves awareness but also had a good impact on evaluation and ethics. Al-Abdullatif (2025) found that awareness was very important. It had a strong positive influence on ethics, evaluation, and usage. These studies accordingly indicate that usage and awareness serve as the core driving forces across the four dimensions. Existing studies are helpful in understanding the connections between different dimensions of AI literacy. EFL students, however, mainly use AI for language learning. Their concerns regarding ethics and evaluation may differ from those of other populations. Therefore, understanding the relationship between these dimensions is very important for cross-cultural and cross-group studies.

Theoretical and Conceptual Framework

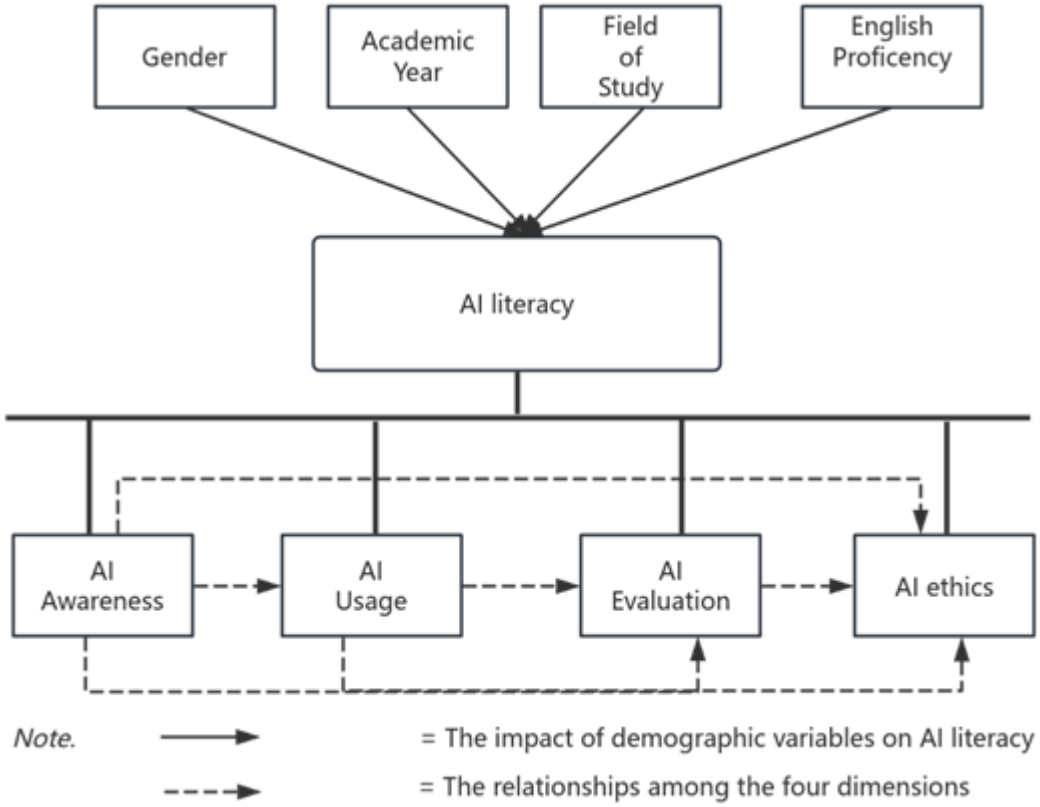
This study used the four-dimensional framework of AI literacy proposed by Wang et al. (2023). This framework has four dimensions: awareness, usage, evaluation, and ethics.

These terms, “AI awareness,” “AI usage,” “AI evaluation,” and “AI ethics” are used for the convenience of analyzing data in this study.

To more clearly illustrate the research approach of this study, the following conceptual framework diagram has been constructed. Centered on Wang et al.’s (2023) four-dimensional AI literacy model (awareness, usage, evaluation, ethics), this framework systematically presents the overall research framework for AI literacy among Chinese undergraduate EFL students. Detailed information is shown in the Figure 1.

Figure 1

Conceptual Framework of AI literacy among Chinese EFL University Students



Specifically, this study first examined EFL students’ AI literacy levels across four dimensions (corresponding to RQ1a). Then it investigated whether significant differences exist among these four dimensions (corresponding to RQ1b) Thirdly, it analyzed differences in AI literacy dimensions based on demographic variables such as gender, academic background, academic year, and English proficiency (corresponding to RQ2). Finally, it explored relationships among the four dimensions of awareness, usage, evaluation, and ethics (corresponding to RQ3). Through these analyses, this study aims to systematically reveal the overall state and influencing patterns of AI literacy among Chinese EFL students, providing empirical evidence for subsequent educational interventions.

Method

Research Design

This study employed a quantitative research method and a cross-sectional survey design. Cohen et al. (2018) claimed that quantitative research can analyze the variable. The relationships between different dimensions of AI literacy and demographic variables such as gender, academic background, academic year, and English proficiency among Chinese university students was revealed with quantitative research. Moreover, the cross-sectional survey design was utilized because it is suitable for effective and rapid gathering large numbers of data and conducting analyses within a short time (Creswell, 2014).

Participants

There were 401 EFL undergraduates recruited from three AI-integrated EFL teaching and learning universities in Guizhou, Southwest China. Only 384 valid questionnaires were ultimately included in the analysis. Purposeful sampling was employed, requiring all participants to meet the criterion of currently taking English classes or enrolling in English electives with diverse English proficiency. Sophomores and juniors accounted for the largest proportion. Freshmen and seniors participated less due to insufficient understanding of AI tools and internships, respectively, but they were still included in the sample to ensure the integrity of the structure. Meanwhile, these participants covered four fields of study, including humanities, social sciences, natural sciences, and engineering and technology. The distribution across fields of study and academic years highlighted the diversity of various student groups in relation to their proficiency in AI. Table 1 shows the participants' detailed demographic information.

Table 1

Participant Demographics

		N	%
Gender	Female	204	53.13%
	Male	180	46.88%
Academic Year	Freshman	89	23.18%
	Sophomore	135	35.16%
	Junior	129	33.59%
	Senior	31	8.07%
Field of Study	Humanities	131	34.11%
	Social Sciences	129	33.59%
	Natural Sciences	58	15.1%
	Engineering/Technical	66	17.19%
Currently Enrolled in English Course	Yes	384	100%
	No	0	
English Proficiency Level	Low	233	60.68%
	Medium	110	28.65%
	High	41	10.68%

Note. Percentages are based on all participants (N = 384).

Research Instrument

This research utilized a questionnaire comprising 17 items divided into two parts. The initial section gathered demographic data of students, such as gender, academic year, field of study, enrollment in an English course, and English proficiency. The second part of the questionnaire utilized an AI Literacy Scale adapted from Wang et al. (2023) to evaluate the level of AI literacy among Chinese EFL university students. There are total 12 items included in this section, which are organized across four dimensions: AI awareness, AI usage, AI evaluation, and AI ethics with three items of each dimension. Each item was assessed using a 7-point Likert scale, where a score of 7 corresponds to "strongly agree" and a score of 1 corresponds to "strongly disagree." Content validity was assessed by means of expert evaluation before the commencement of the pilot study. Specifically, two domain experts, one with expertise in technology education and the other in English language education, evaluated the items independently. Both consistently confirmed that these adapted items can embody the implication of AI literacy framework and were suitable for the student in EFL field.

In order to assess the survey's clarity of the adapted items and the reliability and validity of the AI Literacy Scale, a pilot study was utilized prior to massive data collection. According to Bujang et al. (2024), the participants in the pilot study were no fewer than 30 people. This pilot study recruited 35 participants before collecting the main data. Brief clarifications and explanations were added to the three items about the awareness dimension, and all reverse-coded items were reworded to improve clarity and comprehension based on participants' feedback.

The scale demonstrated good reliability and validity. The Cronbach's alpha coefficients for these four sub-scales ranged from 0.723 to 0.833, while the entire scale reached 0.905, which was higher than the standard level of 0.70 (Chua, 2020). Overall, the reliability and validity of this questionnaire were good.

Data Collection

A total of 401 EFL university students were enrolled. Two criteria were used to clean invalid data: (i) A completion time of less than 35 seconds owing to the fact that the average time to complete the questionnaire in the pilot study was about 35 seconds, and (ii) the same response across all 12 scale items, which follows common practices for detecting careless responses in survey research (Huang et al., 2012). A response rate of over 80% is acceptable (Baruch & Holtom, 2008). After deleting 17 invalid responses in this research, the final valid questionnaires were from 384 participants, with an effective rate of 95.3%.

Data Analysis

IBM SPSS Statistics 27 was employed to analyze the data in this study. The analytical methods included descriptive analysis and inferential analysis. Descriptive analysis was

employed to gather specific information on demographic variables and students' scores across the four dimensions of AI literacy. In addition, inferential analysis was utilized to identify the impact of demographic variables on AI literacy, while Spearman's correlation test was applied to uncover relationships among the four dimensions. Prior to conducting inferential analyses, an assessment of data normality was carried out through the utilization of the Kolmogorov–Smirnov and Shapiro–Wilk tests. The variable did not follow a normal distribution. Therefore, nonparametric tests were used in the study.

Results

Overall State of AI Literacy and Dimensional Differences

The descriptive statistical analysis unveiled the distribution of scores across four dimensions of AI literacy among 384 Chinese EFL undergraduate students. The data revealing the score distribution across the four dimensions can be found in Table 2. It is noteworthy that among these dimensions, AI Ethics yielded the highest average score (M = 5.42), followed by AI Awareness (M = 5.35) and AI Usage (M = 5.32). The AI Evaluation dimension obtained the lowest average score (M = 5.25). Notably, the average scores across all four dimensions were higher than the midpoint (4.0) of the 7-point scale, ranging from 5.25 to 5.42, which indicates that Chinese EFL students' AI literacy level is moderate.

Table 2

Descriptive Statistics for AI Literacy Dimensions

Dimension	Item	Mean	Min	Max	SD
AIA	Q6	5.19	1	7	1.088
	Q7	5.43	3	7	0.948
	Q8	5.43	2	7	1.012
	Mean score	5.35			
AIU	Q9	5.34	1	7	1.030
	Q10	5.23	2	7	1.078
	Q11	5.39	2	7	0.974
	Mean score	5.32			
AIE	Q12	5.17	1	7	1.026
	Q13	5.39	2	7	1.021
	Q14	5.19	2	7	1.117
	Mean score	5.25			
AIET	Q15	5.38	2	7	1.108
	Q16	5.55	1	7	1.184
	Q17	5.32	1	7	1.215
	Mean score	5.42			

Note. SD = standard deviation; Min = minimum; Max = maximum. All items used a 7-point Likert scale. The scale went from 1 (Strongly Disagree) to 7 (Strongly Agree). N = 384. AIA = Awareness AIU = Usage AIE = Evaluation AIET = Ethics

This study employed the Friedman test to test whether there were statistically significant differences among the four dimensions. As shown in Table 3, AI Ethics was much higher than AI Evaluation (Mean Diff. = –.346, $p < .001$, p (Bonf.) = .001). The difference between these two dimensions was statistically significant. AI Usage was lower than AI Ethics

(Mean Diff. = –.223, p = .017). But there was a significant difference between them after Bonferroni correction (p (Bonf.) = .101). Additionally, no significant differences among other comparisons were observed after correction, including AI Evaluation vs. AI Usage (Mean Diff. = .124, p (Bonf.) = 1.000), AI Evaluation vs. AI Awareness (Mean Diff. = .217, p (Bonf.) = .118), AI Usage vs. AI Awareness (Mean Diff. = .094, p (Bonf.) = 1.000), and AI Awareness vs. AI Ethics (Mean Diff. = –.129, p (Bonf.) = .999). In short, there was only one significant difference observed between the AI Ethics dimension and AI Evaluation.

Table 3

Pairwise Comparisons

Sample 1–2	Mean Diff.	Std. Stat.	*p* (Unadjusted)	*p* (Bonferroni-adjusted)
AIE–AIU	.124	1.328	.184	1.000
AIE–AIA	.217	2.334	.020	.118
AIE–AIET	–.346	–3.717	<.001	.001
AIU–AIA	.094	1.006	.314	1.000
AIU–AIET	–.223	–2.390	.017	.101
AIA–AIET	–.129	–1.384	.166	.999

Note. Sample 1–2 = comparison between two samples; Mean Diff. = Mean Difference; Std. Stat. = Standard Test Statistic; p = the significance (p-value) of the test. The significance level is .050. p (Bonferroni-adjusted) = adjusted significance after Bonferroni correction. AIA = Awareness; AIU = Usage; AIE = Evaluation; AIET = Ethics.

Demographic Variables' Influence on AI Literacy

This study also investigated the differences in AI literacy among different demographic variables (gender, field of study, academic year, and English proficiency). Non-parametric tests were used for these different demographic groups.

With regard to the impact of gender on AI literacy, the Mann-Whitney U test was utilized because of the variables in two groups of gender. As presented in Table 4, the Mann-Whitney U test results demonstrated that female students had a higher mean rank (197.77) than male students (186.53). The rank sums were 40,345.50 and 33,574.50, respectively. However, the significance values of the Mann-Whitney U test (17,284.500), the Wilcoxon W test (33,574.500), and the Z value (-0.992) were 0.321, which exceeded the significance threshold of 0.05. This indicates that gender differences in AI literacy scores were not statistically significant.

Table 4

Differences in Students' AI Literacy by Gender (Mann–Whitney U Test)

Variable	Group	N	Mean Rank	Sum of Ranks	U	Z	*p*
AI Literacy	Male	180	186.53	33574.50	17284.500	-.992	0.321
	Female	204	197.77	40345.50			

Note. U = Mann–Whitney U test statistic; p = the significance (p-value) of the test. The significance level is .050. Z = The standardized test statistic.

The Kruskal–Wallis H test was employed owing to the variables with three or more groups (Academic Year, English Proficiency, and Field of Study). The results of the Kruskal-Wallis tests were shown in Table 4. Academic year (H = 7.792, df = 3, p = 0.051) and field of study (H = 7.756, df = 3, p = 0.051) demonstrated marginally significant differences with both p-values approaching the 0.05 threshold. Moreover, the analysis shows no statistical significance in terms of English proficiency (H = 7.756, df = 3, p = 0.152).

Taken together, the analysis shows marginal significance for both academic year and field of study, while gender and English proficiency demonstrated no influence on the level of AI literacy among Chinese EFL university students.

Table 5

Differences in Students' AI Literacy by Demographic Variables (Kruskal-Wallis Test)

Variable	Category	N	Mean Rank	H	df	*p*
Academic Year	Freshman	89	195.02	7.792	3	0.051
	Sophomore	135	180.67			
	Junior	129	191.23			
	Senior	31	242.06			
Field of Study	Humanities	131	210.71	7.756	3	0.051
	Social Sciences	129	187.01			
	Natural Sciences	58	194.23			
	Engineering & Technology	66	165.57			
English Proficiency	Beginner	233	183.69	3.774	2	0.152
	Intermediate	110	205.04			
	Advanced	41	208.91			
Total		384				

Note. H = Kruskal-Walli's test statistic; df = degrees of freedom; p = the significance (p-value) of the test. The significance level is .050.

Correlations among the Dimensions of AI literacy

To investigate the relationships among the dimensions of AI literacy, this study employed Spearman's rank-order correlation. As shown in Table 6, all correlations were significant at the 0.01 level (two-tailed), from 0.506 to 0.697. The moderate to strong correlations observed in this study indicate close interrelations among the four dimensions of AI literacy. All correlations exhibited large effect sizes (r ≥ 0.50) according to Cohen (1988), suggesting significant connections among the dimensions. Within this set of correlations, AI usage exhibited the most robust associations with other dimensions, particularly displaying the highest relationship with AI Evaluation (r = .697, p < .01), closely followed by AI Awareness (r = .625, p < .01) and AI Ethics (r = .513, p < .01). Additionally, AI Evaluation demonstrated strong positive correlations with AI Ethics (r = .614, p < .01) and AI Awareness (r = .595, p < .01). The correlation observed between AI Awareness and AI Ethics was found to be moderate (r = .506, p < .01). It is worth noting that a particularly strong correlation exists between AI Usage and AI Evaluation, suggesting that hands-on

experience with AI tools is closely associated with the capacity to critically evaluate AI applications and their outcomes among Chinese EFL university students.

Table 6

Correlations among AI Literacy Dimensions

Dimension	1	2	3	4
AI Awareness	—			
AI Usage	.625**	—		
AI Evaluation	.595**	.697**	—	
AI Ethics	.506**	.513**	.614**	—

*Note. ** p<.01 (two-tailed). All correlations are based on N=384.*

Discussion

This study reveals that Chinese EFL tertiary students scored moderately high across all four dimensions of AI literacy, ranging from 5.25 to 5.42 on a 7-point scale. They achieved the highest mean score of 5.42 in the dimensions of AI ethics. AI Awareness was rated at 5.35, followed by AI Usage at 5.32. AI Evaluation received the lowest score of 5.25. The highest score in the ethics dimension indicates EFL tertiary students have a basic yet essential understanding of the moral considerations about AI usage. The participants demonstrate good digital morality and rational AI values, with a clear comprehension to proactively avert ethical risks in the AI application. For these students, extensive campaigns on privacy protection and academic integrity by institutions and media can heighten their consciousness of safeguarding privacy and upholding academic integrity within educational settings (Doyle, 2022; Wu et al., 2025). Furthermore, ethical competence is fostered mainly through the internalization of values and social norms, taking shape and developing in advance even in the absence of systematic technical training (Sari et al., 2025).

However, the finding suggests that EFL students possess a strong conceptual understanding of AI and its ethical dimensions, their engagement with AI tools practically in academic and daily life remain somewhat limited. Consistent with Sari et al. (2025), who found that students predominantly rely on AI applications for completing simple task, this study reveals that EFL students may use AI for routine purposes, with limited exploration of more complicated or advanced functionalities. The result that AI usage ranks third emphases a urgent demand for students to enhance their practical competencies in flexible AI tool operation, precise prompting, and move beyond passive, simple low-level AI use. In addressing these challenges, institution should offer systematic AI literacy courses. In these courses, students are taught prompt design to develop their ability to ask precise questions and interact effectively with AI. Moreover, the students are provided with access to AI practice platforms featuring tools tailored for EFL learners, including grammar checkers, paraphrasing software, and speaking practice apps. These AI platforms can guide them move beyond simple engagement with AI, developing active and efficient AI-assisted English learning habits.

Notably, the lowest AI evaluation among students highlights the necessity of strengthening their critical analysis skills. As Sari et al. (2025) and Laupichler et al. (2023) noted, students struggle significantly to evaluate the reliability and credibility of AI-generated content. Although AI tools such as ChatGPT and DeepSeek can generate content immediately in response to users prompt, sometimes these generated text are untrue or fabricated, some even with potential bias issues (Alansari & Luqman, 2026). This form of AI hallucination creates notable challenges for students who are not equipped with adequate evaluation training skills. They fail to identify errors and biases in AI-generated outputs during cooperation with AI tools.

More alarmingly, Kapania et al. (2022) revealed that users are inclined to accept and place blind trust in AI generated output. The combination of the "AI authority "mindset, referring to students blind trust in AI, and students' low evaluation skills render them vulnerable to trust false or fictitious AI generated contents, ultimately jeopardizing academic integrity. This deficiency of AI evaluation skills can be also largely attributed to flaws in current AI literacy curriculum design. While these courses place importance on basic technical skills and ethical awareness, they provide students with scarce opportunities to train their ability to assess the reliability and correctness of AI-generated contents (Le et al., 2026). This align with the Sari et al. (2025), which fond students generally lack opportunities for critical engagement with AI. Such big gap between AI ethics and AI evaluation may create a critical paradox, where students with high ethical awareness regarding AI use may be lack of critical abilities.

In addressing these challenges, the educational intervention is urgently required. Moreover, considering that evaluation is a high-level thinking skill, it requires students to detect and justify the decisions with AI, which can be fostered by explicit guidance and sustained practice (Le et al., 2026; Long & Magerko, 2020； Ng et al., 2021). Targeted pedagogical interventions from institutions should be provided. One promising approach is the integration project-based learning into AI literacy curricula, as suggested by Ng et al. (2021) and Sari et al. (2025). In the context of EFL instruction, authentic project-based tasks can be conducted. These tasks include AI translation comparisons between different AI tools and multiple AI-powered writing revision, which can foster students' hands-on evaluative ability and strengthen their critical thinking.

This study also examined the impacts of demographic variables (gender, English proficiency, academic background, and field of study) on AI literacy among Chinese undergraduate EFL students. The results revealed that there were no significant differences across dimensions for gender and English proficiency, while academic background and academic year showed only marginal significance.

Specifically, no significant gender disparities indicate that male and female students exhibit same level of AI literacy in this study. These findings show that gender did not

impact AI literacy of Chinese EFL university students. Some empirical studies have also confirmed this (Mansoor et al., 2024; Rožman et al., 2025). However, this finding conflicts with prior studies, such as Li et al. (2026), who demonstrated that a notably disparity between female and male in terms of AI attitude and behavior can be identified. Furthermore, O'Dea et al. (2024) claimed that gender demonstrates a significant influence on both the frequency of AI usage and its intended purposes. Gender bias is identified in these prior researches, while no such disparities were observed in the current research. The lack of such disparities in this study may be explained by overly generalized research in terms of AI literacy or a high female participants ratio, which underscores that further study should identify potential gender based variations in AI literacy with more holistic research method. They can also explore gender differences separately in specific dimensions, such as AI awareness, AI usage, AI evaluation and AI ethics.

Furthermore, insignificant differences in AI literacy based on the English proficiency indicates that students across different English levels share same levels of AI literacy. However, Webb et al. (2026) revealed that English proficiency can indirectly affect the development of AI literacy through its influence on learners' ways of using AI. Students with low English proficiency tend to rely on AI to complete various language tasks, which limits the chance to exercise and develop their critical evaluation abilities; while learners with high English proficiency are better at leveraging AI in a complementary human-machine collaboration manner, which is more conducive to the positive improvement of AI literacy. Their findings show that English proficiency does not have a direct and significant impact on AI literacy, but it can indirectly influence AI literacy by affecting the "usage patterns". For further studies therefore may adopt longitudinal designs to track the students with same English proficiency, examining whether improvements in English proficiency lead to shifts in AI usage patterns and subsequently enhancing AI literacy.

Subsequently, marginal significance in AI literacy in terms of field of study shows that students from different major possess relatively similar levels of AI literacy. However, this findings are not consistent with other studies (Mansoor et al., 2024; Hornberger et al., 2023; Toker Gokce et al., 2024). Hornberger et al. (2023) demonstrated that students with a technical study background exhibit high levels of AI literacy. Similarly, Toker Gokce et al. (2024) and Mansoor et al. (2024) revealed that students' field of study significantly predicted their AI literacy. In notably contrast to these findings, this study challenges the pervasive belief that STEM students tend to possess higher levels of AI literacy than their peers in the humanities and social sciences (Lee et al., 2024). The facts that the advantage of a technical background can be weakening with the shift of generative AI toward natural language interaction may be explained this discrepancy. AI literacy is gradually becoming a cross-disciplinary competency available to all students, regardless of their major. This divergence underscores that the relationship between

field of study and AI literacy remains an open issue that urgently requires more empirical research to clarify.

Finally, marginal significance in Chinese EFL university students based on academic year was identified in this research, suggesting there is no significant grade-level variations in AI literacy. This finding corroborates with the findings of O'Dea et al. (2024) and Sari et al. (2025). O' Dea et al. (2024) explicitly concluded that age or academical year yield no significant effect on AI literacy. Likewise, Sari et al. (2025) detected no notable age-based disparities in AI literacy among Indonesian tertiary students. Notably, despite being conducted across distinct national contexts, these cross-contextual consensus imply that age or grade level may be a weaker predictor of AI literacy than commonly assumed.

Taken together, the findings indicate that for the EFL students, traditional demographic variables (such as gender and field of study) have a relatively weak impact on AI literacy. Such implication shows that educators should not overly stratify the design when integrating AI into EFL education. Instead, they should build a universal AI literacy curriculum for all students. More attention should be paid to students' actual AI usage behaviors. More importantly, the focus of AI literacy education should be on cultivating students' critical thinking skills and evaluation ability.

In addressing the third question, the Spearman correlation test demonstrated strong interconnections among the four dimensions including awareness, usage, evaluation, and ethics, suggesting that these four dimensions were significantly and positively correlated with one another. This findings further validate findings of Wang et al. (2023), Al-Abdullatif (2025) and Zhao et al. (2022), which collectively confirm the theoretical assumption of AI literacy as a multidimensional integrated construct. The strong inter correlations among the four dimensions observed suggest that AI literacy is not a collection of discrete skills but rather discrete skills (Long & Magerko, 2020). This underscores that AI literacy development for EFL tertiary students does not need to address each dimension in isolation. Interventions should be designed to promote reflective AI use and simultaneously enhance students' awareness, critical skills, and ethical sensitivity. This aligns with the recommendation by Ng et al. (2021) that AI literacy should be taught through authentic, project-based tasks that integrate multiple dimensions of competence.

Furthermore, this study identified the strongest relationship between AI usage and AI evaluation, in which the students capable of using them effectively in academic and daily life are more likely to judge AI applications critically. This aligns with Al-Abdullatif (2025), who claimed a significant relationship between evaluation and use. Social Cognitive Theory (Bandura, 1986) posits that direct experience is the primary and central source of cognitive development, which indicates that the ability to evaluate AI tools and AI generated contents essentially depends on users' first-hand experience. This empirical

result further suggests that practical engagement with AI renders EFL university students to recognize AI-generated inaccurate and fabricated content, distinguish the authenticity of relevant content and identify its potential misleading nature, and thus cultivates their capacity for critical evaluation. Existing literature also confirms the inherent inter-dependency between AI usage and AI evaluation. Verano et al. (2025) asserted that students are inevitably exposed to false and biased content produced by AI in routine use of AI tools. This process renders them foster independent critical thinking and evaluation capacity over time.

In educational practice, this outcome implies that intervention about AI literacy should not be isolated from theoretical knowledge and hands-on AI usage practice. To strengthen students' AI evaluation competence, educators are encouraged to deliver more authentic task-based AI learning experiences.

Conclusion

This study investigated AI literacy among Chinese undergraduate EFL students using a four-dimensional framework (awareness, evaluation, usage, and ethics). The findings revealed that Chinese EFL students demonstrate generally positive AI literacy levels across all dimensions. For the impact of demographic variables (gender, English proficiency, academic year, and field of study) on AI literacy, the results showed that academic year and field of study have marginal significance, while gender and English proficiency do not influence AI literacy. Notably, there are strong interdimensional correlations among the four dimensions. Among these correlations, a particularly strong one was observed between AI usage and AI evaluation. These results contribute to the understanding of the level of AI literacy among Chinese EFL university students and provide insights for the integration of AI tools into EFL education.

Moreover, the limitation of this study lies in simple research methodology. The questionnaire data primarily depend on participants' self-reported responses. These actions are easy to be influenced by social desirability effect, self-perception biases. Therefore, students' actual performance in real learning contexts cannot be reflected. Future research may incorporate mixed method approaches alongside quantitative surveys, such as integrating qualitative interviews to comprehensively reveal students' actual performance across awareness, application, evaluation, and ethical dimensions.

ORCID

 https://orcid.org/0009-0009-0920-3887
 https://orcid.org/0000-0001-5683-0722

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The claims, arguments, and counter-arguments made in this article are exclusively those of the contributing authors. Hence, they do not necessarily represent the viewpoints of the

authors' affiliated institutions, or EUROKD as the publisher, the editors and the reviewers of the article.

Acknowledgements
Not applicable.

Funding
No specific grant from any funding agency.

CRediT Authorship Contribution Statement
Liuzhi Zhang: Conceptualization, Writing - Original Draft, Formal analysis, Investigation, Methodology, Visualization
Ruey Shing Soo: Conceptualization, Project Administration, Validation, Methodology, Writing – Review & Editing

Generative AI Use Disclosure Statement
In the preparation of this manuscript, Generative AI tools were utilized in several stages of the research process. AI was employed for: 1) Data Processing and Refinement; 2) Language Polishing and Editing. Specifically, AI tools were used to process and refine datasets, particularly in terms of formatting and data visualization. The tool used for this purpose was ChatGPT. The authors have reviewed and edited all AI-generated content and shoulder responsibility for the entirety of this work.

Ethics Declarations
World Medical Association (WMA) Declaration of Helsinki–Ethical Principles for Medical Research Involving Human Participants
This study was conducted in accordance with established ethical guidelines. Informed consent was obtained from all participants prior to data collection, and strict confidentiality and anonymity were guaranteed throughout the research process.

Competing Interests
No, there are no conflicting interests.

Data Availability
The data that support the findings of this study are available from the corresponding author upon reasonable request.

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